REDACTED VERSION

NEW MEXICO MULTI-SITE COOPERATIVE AGREEMENT FOR CERCLA - PRELIMINARY ASSESSMENT AND SITE INSPECTION, MANAGEMENT ASSISTANCE AT ACTIVE SUPERFUND SITES, AND HOMESTAKE FORWARD PLANNING

PRELIMINARY ASSESSMENT AND SITE INSPECTION STATEMENT OF WORK

The State of New Mexico requests financial assistance for performing preliminary assessment, site inspection, and related tasks as provided under Sections 104 (b) and (d) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). The object of the program will be to assist the U.S. Environmental Protection Agency (EPA) in evaluating potential hazardous waste sites in New Mexico and to identify sites that require remedial action under CERCLA. The State of New Mexico through the New Mexico Environmental Improvement Division (NMEID), which has been designated by the Governor as the lead agency on activities related to CERCLA, is willing to enter into this cooperative agreement and will carry out the activities described in the following Statement of Work.

NMEID, hereafter also referred to as the State, has the authority to enter into this agreement pursuant to Section 74-1-6C of New Mexico Statutes Annotated 1978.

BACKGROUND

The New Mexico Ground Water and Hazardous Waste Bureau of the NMEID and Region VI - EPA established the Hazsit List for New Mexico. EID staff members developed a list of sites from reports, complaints, files and news media articles. The list was broken down and a lead agency, NMEID or EPA, was asigned to perform preliminary assessment and site inspection tasks. New Mexico's responsibilities were discharged under the RCRA 3012 program under a $150,143 grant from EPA.

NMEID conducted thirty-nine (39) field inspections under the RCRA 3012 program and was able to resolve the potential for contaminant release at a large number of the listed sites; however, some of the sites require further investigation. In addition, discovery actions under the RCRA 3012 program have identified new sites that require preliminary assessment and site inspection.

SCOPE OF WORK

To meet the objectives of the multi-site cooperative agreement program for preliminary assessment and site inspection (MSCA PA/SI), the following activities will be carried out by the State:

PRELIMINARY ASSESSMENTS (PA): A preliminary assessment will consist of activities necessary to complete the EPA Preliminary Assessment Form 2070-2. The following are some of the tasks that are anticipated in carrying out a PA:

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- interviews with Federal, State, and local government personnel,and fire departments;
- review of Federal, State, local government files, reports, and court cases;
- limited title searches;
- review of U.S. Geological Survey, Soil Conservation Service,State Water Resource Offices, or other comparable institutionswith geological, hydrological and topographical data;
- review of State and local private and public well logs;
- review of Federal and local meterological data;
- review of land use data from local planning agencies;
- review of available aerial imagery;
- review of flood insurance rate maps available through the U.S.Department of Housing and Urban Development;
- off-site reconnaissance of site (windshield survey).

Each preliminary assessment will take an average of 51 person-hours to complete. A preliminary assessment will be considered complete when the EPA Form 2070-2 is approved and accepted by the EPA Regional Project Officer.

SITE INSPECTIONS (SI): The purpose of an SI is to better define the extent of the problems at a site and provide a data base to determine the next action. To accomplish this objective, site-specific data on the hazardous substances present, pollution dispersal pathways, types of receptors and site management practices will be gathered. To adequately complete the EPA Site Inspection Form 2070-3, the following types of actions may be carried out.

- collect/analyze soils and off-site samples;
- collect/analyze ground water samples from existing wells;
- collect/analyze samples or take readings of volatile organics in air;
- collect/analyze samples from open drums or lagoons;
- survey and document site, structures, topography, lagoons, drainage,drums, bulk tanks, monitoring wells, roads, access, boundaries, etc.;
- document location of homes, public buildings, natural areas, etc.;
- scan site for underground tanks and/or drums using a metal detector;
- review of operator records.

The scope of an inspection will vary depending upon the nature of existing information. However, based on RCRA 3012 experience, each site inspection will

take an average of 169 person-hours. A site inspection will be carried out at each site where a preliminary assessment is completed. A site inspection will be considered complete when the EPA Form 2070-3 is approved and accepted by the EPA Regional Project Officer.

Site safety plans will be prepared prior to undertaking on-site inspections. These safety plans will be consistent with the requirements of CERCLA 104(f), U.S.- EPA's Occupational Health and Safety Manual, and other applicable U.S. - EPA safety guidance. In awarding contracts or making subagreements to any person engaged in actions funded by this agreement, the State will require compliance with federal health and safety standards by contractors and subcontractors as a condition of such contracts or subagreements.

RESPONSIBLE PARTY SEARCHES: A responsible party search will be carried out at each site where a site inspection is conducted. The activity that will be carried out under this grant will be limited to gathering data that is readily available through sources discovered during preliminary assessments and site inspections. Responsible party search activities will take an average of twenty hours at each site and a responsible party search will be done at each site that requires a site inspection. The time required for responsible party search has already been included under site inspection activity. A responsible party search will be considered to be complete when a determination of the responsible parties is made and that information is recorded on EPA Form 2070-3 and accepted by the EPA Regional Project Officer.

SITE INSPECTION FOLLOW-UP (SIF): Many potentially hazardous sites cannot be adequately evaluated within the limitations of a routine site inspection. Therefore, these sites will require follow-up inspections. Before a site-inspection follow-up is initiated, NMEID will:

(1) coordinate with EPA from the planning stages through the conclusion of the action, and

(2) develop a work plan and sampling plan for the site which will be submitted to EPA for approval and then the State will implement the plan.

PROJECT COORDINATION

The State will coordinate with EPA in carrying out the tasks of this grant. The MSCA PA/SI Project Manager will make at least one trip to EPA Region VI Dallas Office for personnel training, for coordination prior to initiating each follow-up inspection, and for inspecting additional files kept at the Regional Office. Other trips that may be necessary for coordination will be carried out by EPA or by the State depending on the availability of resources.

SAMPLE ANALYSIS

1) The State has determined that the Scientific Laboratory Division (SLD) of the New Mexico Health and Environment Department will be used for site inspections and site inspection follow-up sample analyses.

2) The Quality Assurance Project Plan (QAPP) prepared for SLD under the RCRA 3012 program will also be used for analytical procedures and quality assurance/control under this multi-site cooperative agreement.

PERSONNEL RESOURCES
The MSCA PA/SI Project Team will be led by a Water Resource Specialist III, who will serve as Project Manager and perform the functions of hydrogeologist, aqueous geochemist and geotechnical engineer. The Project Manager will also:

1) be the contact person for the program, and thus work closely with the EPA MSCA PA/SI Regional Project Officer;

2) be responsible for assuring that the tasks in the work plan are completed and that required reports and forms are sent to the EPA Project Officer within the described time frames;

3) notify the EPA Regional Project Officer immediately by phone of an event that would alter the scope or nature of the work described in the Scope of Work; and

4) assist the EPA Regional Project Officer in an overview of the grant.

The Program Manager would supervise two other employees, an Environmental Scientist and a Secretary II. The Environmental Scientist's primary tasks would be to assist the Project Manager at site inspections and work independently in the office on information gathering or report preparation. The Secretary would be responsible for routine correspondence, filing, and preparing both draft and final versions of project reports.

NMEID intends to upgrade the RCRA 3012 Project Manager to Water Resource Specialist III and hire an additional Environmental Scientist to accomplish the tasks described in this grant in order to avoid use of personnel committed to other grant obligations. The Secretary II position will be shared with the other grant programs supported under this same multi-site cooperative agreement.

EQUIPMENT
Lease of field vehicle
(all NMEID vehicles obligated to other programs)

OVERSIGHT
The State will carry out the following tasks to assist EPA in oversight of this grant. New Mexico Environment Improvement Division shall submit summary progress reports on a quarterly basis. This report will be submitted to the MSCA PA/SI - RPO no later than thirty days after the end of each quarter (i.e.January 30, April 30, July 30, and October 30).

NMEID agrees to submit progress reports to EPA within 30 days after the conclusion of a fiscal quarter. These reports will include site-specific tracking of costs and activities. The reports will cover the following:

- number and names of sites where preliminary assessments, site inspections, responsible party searches, or site inspection follow-up have been completed or are underway,

- number and names of sites where preliminary assessments, site inspections, responsible party searches, or site inspection follow-up activities will be initiated during the next quarter,
- submission schedule for the next-qaurter's activities,
- funds expended to date,
- status of contracting (if appropriate),
- itemization of expenditures by each activity,
- percentage of work completed during the quarter,
- disposition of completed sites,
- personnel hours spent at each site per PA, Si, SIF, and management assistance,
- any problems or delays that have developed,
- revisions to the schedule of tasks designated in the original application or previous quarterly report, and
- topics concerning problems, trends or explanations for differences in anticipated versus completed work production.

PROGRAM SCHEDULE

NMEID proposes a program that includes twelve (12) preliminary assessments (PA) and twelve (12) site inspections (SI). In addition, NMEID anticipates that four (4) site inspection follow-up (SIF) investigations will be necessary. Work will commence on January 1, 1985 and would continue until September 30, 1985. The types of actions and sites at which they will be taken are shown below:

SITE	PA	SI	SIF
1) Mesa Oil Recycler, Albuquerque	X	X	
2) Bernalillo Woodtreaters, Albuquerque	X	X	
3) Walker A.F.B. (abandoned), Roswell	X	X	
4) Rhemah Oil Recyclers, Hobbs	X	X	
5) Pub. Serv. Co. N.M. - Person Station, Albuquerque	X	X	
6) Sparton Technology, Albuquerque	X	X	
7) Continental Mining Co., Fiero	X	X	
8) Peru Hill Mill, Deming	X	X	
9) Playa-Hidalgo Smelter, Lordsburg	X	X	
10) Caribou Refinery, Farmington	X	X	
11) Pecos Mine Tailings, Pecos	X	X	
12) Elizabethtown Mining District, Elizabethtown	X	X	
1) Prewitt Refinery			X
2) West Hobbs, section 30			X
3) Hanover Creek Mining District, Hanover-Fiero			X
4) One additional site, not identified at this time.			X

(See Attachment A - Program Schedule and Work Plan, page 15)

PROGRAM RATIONALE

The purpose of these funds is to investigate, inspect and evaluate possible hazardous waste sites throughout the State of New Mexico. This process will enable the State of New Mexico, to prioritize all of the sites listed in ERRIS in the State and recommend any remedial actions necessary. These funds will also be used to expedite the process for moving selected sites toward resolution and to ensure that the MSCA PA/SI Program does not inhibit but rather compliments the existing CERCLA Program.

The State grant application approximates the maximum funds available for the purpose of allowing the State to gain maximum information through the preliminary assessment, site inspection, site inspection follow-up, and responsible party search processes for the evaluation and ranking of ERRIS sites. This information will be used to determine if any of these sites will qualify as candidates for the National Priority List.

MANAGEMENT ASSISTANCE PROGRAM
STATEMENT OF WORK

The CERCLA management assistance program will be under the direct supervision of Dr.Richard Perkins, Health Program Manager of the Ground Water Surveillance Section of NMEID. Dr. Perkins will hire one (1) Environmental Scientist to perform the duties of the program and to act as Superfund Coordinator for NMEID. Four active Superfund sites will be studied under this multi-site cooperative agreement. The sites and the duties of the Superfund Coordinator are outlined below:

- ATCHISON, TOPEKA, AND SANTA FE RAILROAD - CLOVIS
  This site will require two visits (only one if there is no activity at the site during the period of this contract). In addition, two reports will be reviewed.

- UNITED NUCLEAR CORP. - CHURCHROCK
  Geological and hydrological data from thius site will be reviewed and will be discussed in meetings with EPA. EPA work plans and reports will be reviewed and commented upon. Monitoring well installation will be observed. Sampling reports will also be reviewed.

- HOMESTAKE MINING - GRANTS
  Implementation of the Final Remedial Design will be monitored with site visits as needed.

- SOUTH VALLEY - ALBUQUERQUE
  Administrative orders, work plans, reconnaissance, summary reports, Phase II work plans, and final reports will be reviewed for all six responsible parties. All six source control investigation reports will be reviewed. EPA's aquifer reclamation report, feasibility report and final report will also be reviewed.

PRELIMINARY ASSESSMENT WORK PLAN

TASK	TIME REQUIRED PER SITE (person-hours)
1. Gather site information Nature/quantity of hazardous substances Evaluate potential for exposure Identify possible target populations and environments	15
2. Review and evaluate data	20
3. Draft PA report Document findings Determine relative seriousness of hazards associated with site Recommend disposition of site and provide justification for disposition	
4. Project Manager review and comment	6
5. Type, copy and file report	6
6. EPA - Region VI approve report - edit report if necessary	4
TOTAL PER SITE	51 hours

PRELIMINARY ASSESSMENT BUDGET BREAKDOWN
(PER SITE)

CATEGORY	COST
(b) (4)	[redacted]

PRELIMINARY ASSESSMENT BUDGET BREAKDOWN
(TOTAL COST - 12 sites)

CATEGORY	COST
(b) (4)	[redacted]

SITE INSPECTION WORK PLAN

TASK	TIME REQUIRED PER SITE (person-hours)
1. Perform background search	15
PA file review	
EID division-wide file review	
Literature search for information on toxicity and persistence of hazardous substances	
Review maps, aerial photos and other records	
2. Prepare study plan and site-safety work plan	10
3. Coordinate site visit	12
Obtain site access	
Prepare equipment, obtain field supplies, coordinate other logistical needs	
Notify laboratory contacts of sampling activity	
4. Site inspection field work	48
Site mobilization	
Interview employees/owners	
Assess geology/topography	
Identify potential receptors	
Document site activities	
Prepare site map	
Collect, package, and ship samples to lab	
Decontaminate/demobilize	
5. Review analytical data	20
6. Compile and evaluate data; file report	20
7. Calculate HRS score	15

SITE INSPECTION WORK PLAN
(continued)

TASK		TIME REQUIRED PER SITE (person-hours)
8.	Review of SI by Project Manager	6
9.	Type, copy and file report	19
10.	EPA - Region VI approval; edit report if necessary	4
TOTAL PER SITE		169 hours

SITE INSPECTION BUDGET BREAKDOWN
(PER SITE)

CATEGORY	COST
(b) (4)	

SITE INSPECTION BUDGET BREAKDOWN
(TOTAL COST - 12 sites)

CATEGORY	COST
(b) (4)	[redacted]

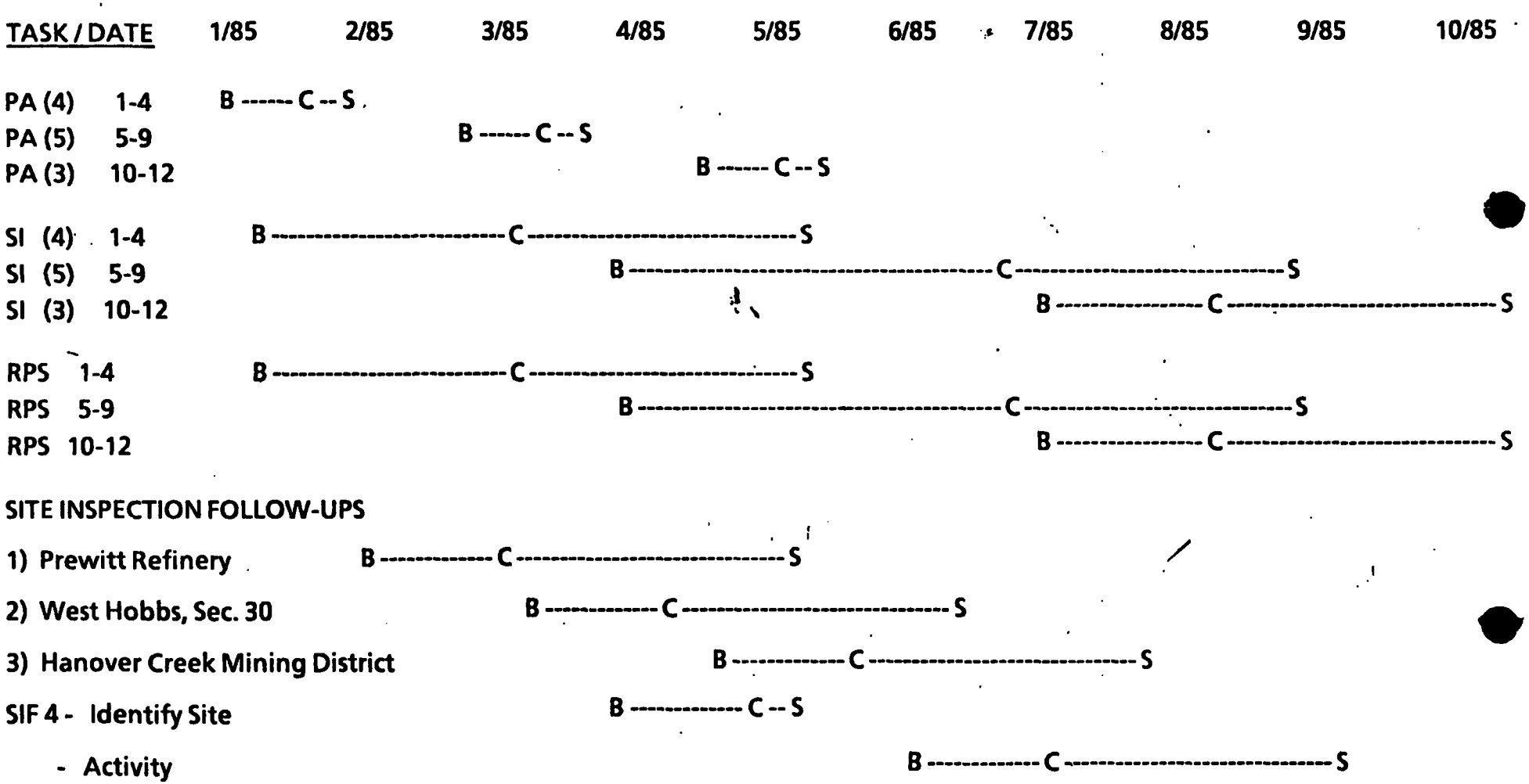
SITE INSPECTION FOLLOW-UP BUDGET BREAKDOWN
(PER SITE)

CATEGORY	COST
(b) (4)	[redacted]

SITE INSPECTION FOLLOW-UP BUDGET BREAKDOWN
(TOTAL COST 4 SITES)

CATEGORY	COST
(b) (4)	[redacted]

ATTACHMENT A
PROGRAM SCHEDULE AND WORK PLAN - CERCLA PA/SI



LEGEND
B = Begin Task
C = Complete Task
S = Submit report

The numbers 1 - 12 identify sites as designated in the Statement of Work narrative, pg. 5

Attachment 1

RADIOLOGICAL ASSESSMENT OF THE POPULATED AREAS SOUTHWEST OF THE HOMESTAKE MINING COMPANY URANIUM MILL

JERE B. MILLARD

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SURVEILLANCE AND ASSESSMENT SECTION
RADIATION PROTECTION BUREAU
ENVIRONMENTAL IMPROVEMENT DIVISION
HEALTH AND ENVIRONMENT DEPARTMENT

August 1984

HOMESTAKE FORWARD PLANNING PROJECT
STATEMENT OF WORK

INTRODUCTION

The purpose of this application is to obtain funding for the New Mexico Radiation Protection Bureau (NMRPB) to develop a workplan outlining the remedial investigation activities necessary to adequately define existing radiological impacts to residential areas adjacent to the Homestake Mining company (HMC) uranium extraction facility near Milan, New Mexico. The HMC site has already been placed on the National Priorities List as a result of groundwater impacts. However, atmospheric impacts have recently been identified by the NMRPB in a preliminary radiological assessment of HMC and nearby populated areas. The assessment has documented indoor radon and radon daughter levels in five residential structures near HMC as well as ambient outdoor radon concentrations for a one year period. This sampling effort was conducted in conjunction with the assistance of the EPA-Las Vegas Office of Radiation Programs. Incremental risk of premature cancer death resulting from exposure to radiological effluent released from HMC was also discussed in the NMRPB assessment of August 1984 (Attachment 1).

Due to the experience NMRPB has with the HMC site, past radiological sampling activities it has conducted and the concern for the health and safety of residents nearby HMC, the NMRPB wishes to take the lead in developing necessary remedial activities for this site. A review of the NMRPB by both EPA and CDC has also identified the need to further safeguard the public health of local residents. However, due to limited NMRPB personnel resource constraints and a lack of available State funds for remedial action planning of CERCLA projects, EPA Forward Planning resources have been requested.

DEVELOPMENT OF WORK PLAN

The NMRPB intends to construct a work plan for a remedial investigation of the HMC site through a contract(s) with qualified consultants familiar with radon and radon daughter work. This effort will be completed prior to October 1985. The following remedial investigation support plans will also be prepared in conjunction with the work plan prior to onsite remedial activities:

Quality Assurance Project Plan
Health and Safety Plan
Site Sampling Plan
Management Plan

All of these plans will be developed along specific guidelines presented in USEPA report, Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (1980) or other documented EPA guidance.

The work plan will be developed by the NMRPB and its consultants such that all necessary remedial investigation activities are clearly identified along with each of their associated cost estimates, time schedules and deliverables. A project officer within the NMRPB who is primarily responsible for radiological work at the HMC site will have oversight authority over all other persons assisting in developing the work plan.

1.0 INTRODUCTION

This report provides a detailed assessment of the radiological risk to individuals living in the residential areas southwest of the Homestake Mining Company (HMC) uranium mill. The purpose of this assessment is to determine a quantitative estimate of risk from living near this uranium milling facility. The Homestake mill is the only facility in the state with a population (approximately 200 individuals) in close proximity.

Computer modeling was used extensively to calculate environmental concentrations of radionuclides released from the facility and the dose to individuals from these releases. In addition, background levels of radiation in the area were also evaluated. In order to increase the accuracy of the calculated doses, previously collected monitoring data was used in place of modeled concentrations whenever possible. Finally, the risk of radiation induced cancer per year of exposure in the Homestake area was evaluated.

2.0 RADIOLOGICAL ASSESSMENT

The Homestake uranium mill releases measurable amounts of radiation via several pathways. Radon gas emanates from the ore storage pile, the tailings pile and from the ore during the milling process. Dust particles containing radionuclides are also released. Radionuclides from the tailings pile can seep into the ground water or enter the food ingestion pathway leading to man by contaminating water sources, grazing animals or vegetable gardens.

In order to assess the problem, monitoring programs have been implemented to determine concentrations of nuclides being released. These programs will be discussed in greater detail in the following sections.

2.1 Inhalation

An assessment of the risk of inhaling radioactive particulates, radon and radon daughters is made in this section. Radon was measured both indoors and outdoors and the dose from this exposure was calculated. As an aid in determining doses to individuals, the MILDOS computer code (1) was used. The code uses an RBE of 10 and USNRC dose conversion factors (8). It also assumes a non-occupational breathing rate. Parameters such as meteorological data, radionuclide release rates and receptor locations are fed into the code, which then calculates radionuclide concentrations in air at each receptor location. Fifty-year dose commitments (DC-50) per year of exposure (the cumulative dose over a fifty year period from radionuclides remaining in the body from one year of intake) are then derived by multiplying annual intakes by the appropriate dose conversion factors. When available, measured concentrations were used to modify modeled results to ensure that predicted values were more accurate.

identical to the mean observed for PERM units, it would appear that this is a realistic estimate for the average indoor radon concentration for community homes. As a
further confirmation, indoor working levels were measured at one of the homes in Murray Acres. Eleven measurements during the period of 10/83 through 6/84 gave a mean and standard error of 0.029 ± 0.003 WL. If a 51% equilibrium is assumed, this corresponds to 5.7 pCi/l. This value may be biased towards the high side since a full year of data is not yet available.

There appears to be no physical mechanism that could concentrate indoor radon from ambient air to levels above outdoor values because it is a chemically inert gas (much the same as nitrogen molecules in the atmosphere). Therefore, it was assumed that indoor radon from the HMC facility would be equal to outdoor concentrations from the same sources. 1.62 pCi/l was assumed to be from the milling facility and (4.86 -1.62) = 3.24 pCi/l was from background and indoor sources. This value is higher than those measured in five local background structures, which averaged 1.84 ± 0.15 pCi/l. Of these five, two were located in Grants and one each in Milan, Bluewater and San Mateo. Two of these were in schools, two were in private homes and one was located in an office building. This background average value (1.84 pCi/l) converts to 0.009 WL assuming 51% equilibrium. This can be compared to a mean indoor background working level value of 0.0057 as reported by George and Breslin (3) for 29 control homes in Grand Junction, Colorado. Thus, the elevated value of 3.24 pCi/l cannot be completely explained by background. The increase could be due to homes placed on soil contaminated with wind blown tailings, from elevated radon in water released in the home or from building materials that contain radium. However, no data currently exist to substantiate any of these contentions.

George and Breslin measured indoor (first floor) radon and radon daughter concentrations. An average 51% equilibrium value was derived from this data set and used for all indoor calculations. Background indoor working levels were thus calculated as follows:

$$(3.24\ \text{pCi/l})\ (0.01\ \text{WL/pCi/l})\ (0.51) = 0.0165\ \text{WL}$$

This converts to an exposure of 0.850 WLM and an absorbed dose of 5100 mrem. Assuming an indoor occupancy factor of 80% (5) leads to a dose of 4080 mrem.

Indoor working levels due to the milling facility were calculated below:

$$(1.62\ \text{pCi/l})\ (0.01\ \text{WL/pCi/l})\ (0.51) = 0.0083\ \text{WL}$$

This value results in a dose of 2050 mrem including the 80% occupancy factor. The total dose from indoor radon from all sources is therefore 6130 mrem.

Table 2.1 provides a summary of absorbed dose resulting from exposure to radon released from the tailings pile and natural background sources. These doses are calculated assuming that everyone spends 100% of their time at their home and are therefore conservatively high. If an individual does spend several hours a day away from home, his dose would be lowered accordingly. However, there are people that do spend nearly all their time at home.

Table 2.3 Fifty Year Dose Commitments Per Year of Exposure to Individual Organs (mrem) from Inhalation of Background and HMC Facility Air Particulate Concentrations at Murray Acres

Radionuclide	Whole Body	Bone	Lung	Liver	Kidney
U-238	0.10	1.8	11.4	0.0	0.40
U-234	0.12	1.9	12.9	0.0	0.46
Th-230	0.12	4.2	2.0	0.24	1.19
Ra-226	0.02	0.2	3.1	3.0×10^{-5}	8.5×10^{-4}
Pb-210	0.10	3.1	11.3	0.78	2.56
Total	0.46	11.2	40.7	1.02	4.61
MILDOS Prediction	0.17	3.95	13.3	0.14	1.03
Ratio (Total/Mildos)	2.71	2.84	3.06	7.29	4.48

Background radionuclide concentrations in air were also measured at San Mateo, some 15 miles to the northeast. By subtracting these values from the concentrations at Murray Acres, the contribution from the milling facility can be estimated. The percent of the concentration due to the facility is found by dividing the milling facility contribution by the total (Table 2.2). This ratio is then applied to the dose in Table 2.3 to obtain the dose from the facility. These are shown in Table 2.4.

Furthermore, the dose due to background airborne radionuclides is found by subtracting the doses in Table 2.4 from those in Table 2.3. These doses for whole body, bone, lung, liver and kidney are 0.07, 2.45, 6.97, 0.43 and 1.51 mrem/yr. respectively.

local wells were the major source of drinking water. Even though Homestake provides bottled water, some residents continue to use well water, as determined by interviews with local residents.

*Since only natural uranium water concentrations were available, U-238 and U-234 were assumed to be in equilibrium.

*Dose conversion factors (DCF) used were also taken from the report by Dunning et al., 1981 (9) and are summarized in Table 2.5. However, Dunning used an RBE of 20 for alpha emitters. To be consistent with the RBE of 10 that has been used throughout this report, we have divided Dunning's values by 2.

Table 2.5 Dose Conversion Factors For All Target Organs (Rem/uCi)

Target Organ	U-238	U-234	Th-230	Ra-226	Pb-210	Po-210
Total Bone	3.5	3.9	0.6	21.5	10.5	0.26
Endosteum	1.4	1.8	8.0	10.0	4.8	0.12
Red Marrow	0.10	0.12	0.5	1.1	0.5	0.27
Liver	6.70E-3	7.90E-3	1.09E-2	0.30	0.7	0.8
Kidney	0.75	0.85	2.16E-3	0.30	0.47	4.7
Lung	7.65E-3	8.60E-3	2.28E-3	0.30	0.15	0.26

(b) Water Concentrations: There are 95 wells in the communities in question and 92 were sampled (97%). Of the sampled wells, 64 (70%) were alluvial and 28 (30%) non-alluvial. Non-alluvial wells had lower concentrations because they are deeper and hence less easily contaminated by surface sources. Mean yearly natural uranium concentrations are shown below in Table 2.6. Concentrations were obtained by averaging all alluvial well water values reported by HMC, EID and others in the 1981 water discharge permit. All HMC U_3O_8 values were converted to natural uranium units of ug/l.

The overall mean and standard error for uranium during all nine years was 1235 ± 121 ug/l with an n=467.

Natural uranium concentrations were also averaged for non-alluvial wells using data reported in the 1981 water discharge permit for HMC. The overall mean and standard error for 96 samples collected from 28 wells from 1976 to 1983 was 93 ± 35 ug/l. This average value is approximately 13 times lower than the average for alluvial wells. However, there was evidence of contamination in non-alluvial wells sampled during 1982 and 1983, with a high value of 2730 ug/l detected. The average without those values indicating contamination was 33 ug/l, which may be a reasonable estimate of natural background levels in the local area.

Thorium-230, lead-210 and polonium-210 have recently been measured in alluvial wells in Broadview and Murray Acres. These values are shown in Table 2.7. Radium-226 values were averaged from all data presented in the HMC Groundwater Discharge Plan.

Table 2.7 1983 Thorium-230, Radium-226, Lead-210 and Polonium-210 Concentrations in alluvial well water from Broadview and Murray Acres (pCi/l).

Radionuclide	n	Mean	s	(sem)
Th-230	4	0.2	0.1	0.07
Ra-226				
Alluvial	314	1.2	0.9	0.05
Non-Alluvial	49	0.7	0.6	0.08
Pb-210	4	6.8	4.6	2.3
Po-210	4	15.7	17.4	8.7

(c) Dose Calculations: Using the overall uranium mean concentration of 1235 ug/l (836 pCi/l) and previously stated assumptions, 50 year dose commitments per year of exposure were calculated for U-238 and U-234, Th-230, Ra-226, Pb-210, and Po-210. Individual DC-50 values were calculated and listed in a table for each target organ in rem/yr using the following generic relationship:

$$DC\text{-}50 = \frac{(\text{concentration})(0.97 \text{ liters})(365 \text{ d})(\text{uCi})(\text{DCF})\ (1000 \text{ mrem})}{(\text{day})\ (\text{year})\ (10^6 \text{pCi})\qquad\qquad (\text{rem})} = \frac{\text{mrem}}{\text{year}}$$

Table 2.9 Fifty Year Dose Commitments Per Year of Exposure to Individual Organs from Air Deposition on Vegetable and Pasture Grass (mrem)

Organ	Vegetables	Meat
Lung	0.39	0.06
Bone	4.44	0.61
Whole Body	0.35	0.72
Liver	0.05	0.15
Kidney	1.61	0.26

Now consider the contribution from irrigation. Assume that irrigation water is applied at a rate of 0.072 l/m^2-hr. The following equation* from Reg. Guide 1.109 (5) was used to calculate radionuclide concentrations in vegetation due to uptake from irrigation water.

$$C_{iv} = (C_{iw})\ (I)\ (r)\ (1-\exp\ (-X_{ei}\ t_e))/Y_v\ x_{ei})$$

where C_{iw} = the concentration of radionuclide i in irrigation water;

I = the average irrigation rate;

r = the fraction of deposited activity retained on crops;

x_{ei} = the effective removal rate of radionuclide i from the crops;

t_e = the time period that crops are exposed to irrigation water;

Y_v = the agricultural productivity.

For example substituting the appropriate values for uranium leads to the following:

$$C_{iv} = \frac{(836\ pCi/l)\ (0.072\ l/m^2\text{-hr})\ (0.2)\ (1-\exp\ (-0.05/d)\ (90d))}{(2\ kg/m^2)\ (0.0021/hr)} = 2834\ pCi/kg$$

We now obtain the total uranium ingested per year from this pathway.

$$(2834\ pCi/kg)(80\ kg/yr)(10^{-6}\ uCi/pCi) = 0.227\ uCi/yr$$

*The entire equation is not presented, since the other terms were not needed for this calculation.

Table 3.1 Summary of Risk Coefficients Used
(Risk/10^6 person-rem)

Target Organ	Risk Coefficient
Total Bone[a]	1.9
Endosteum	1.9
Liver	30
Kidney	5.5[b]
Bronchial Epithelium/ Lung	16.7-166.7[c]

(a) Total bone and endosteum risk coefficients taken from the BEIR III report for a 7000 g bone, and modified to give average skeletal doses for a 5000 g bone by multiplying BEIR coefficients by 5000/7000.

(b) The risk coefficient for kidney was obtained by taking a ratio of low LET risk rate coefficients reported in the BEIR III report and multiplying by the high LET risk coefficient for liver.

(c) This range for bronchial epithelium risk coefficients (risk/10^6 person-rem) was obtained from the following estimates reported in the literature.

Evans	(6)	16.7
Jacobi	(14)	16.7-83.3
NCRP 78	(23)	21.7
NCRP 77	(22)	33.3
UNSCEAR	(15)	33.3-75.0
USNRC	(8)	60.0
BEIR III	(7)	143.0
Archer	(16)	166.7

The USEPA (17) has endorsed the BEIR III estimate of 143.0, which was derived from uranium miner data. Since uranium miner's breathing rates are twice that for an average individual (8), this risk estimate should be reduced by a factor of two. However, the unattached fraction of RaA is nearly twice as high in an average home (7%) than in a mine (4%) (20). Therefore the BEIR III estimate was not corrected for differential breathing rates. The NCRP has also reported risk coefficients estimates of 21.7-33.3. Using the recently reported NCRP 78 age dependent risk coefficients of 21.7 (23), an age average risk estimate of 22.8 was derived using the actual age distribution for Murray and Broadview Acres. Due to the broad range of risk coefficients reported for the bronchial epithelium by various authors, committees and agencies, it was not possible to select a single best estimate. A range of values was therefore used for all lung and total risk calculations to best reflect the current uncertainties in risk estimates.

Since there is a possibility that the exposed population will obtain access to Milan water within the near future, the total risk estimate was therefore considered following elimination of the water ingestion pathway. If this pathway were eliminated it would result in greatly reduced absorbed doses to total bone, liver and kidney. However, the total dose to lung was almost unaffected and therefore the total lifetime risk estimate range of 1/21,300 to 1/2480 per year of exposure was only reduced to 1/25,200-1/2530 from all exposure pathways. A minimally exposed person who spends 50% of his time away from home would, however, reduce his lifetime risk estimate range by a factor of two or 1/50,700 to 1/5075 per year of exposure due to decreased inhalation of radon and particulates.

The maximally exposed individual would have a calculated lifetime risk very close to the risk for the average exposed individual of one chance in 2590 per year of exposure. The maximum and average risk estimates were very close since the maximum and average radon concentrations were very close and dose to lung from radon dominated the total risk estimate. There is a possibility that some community residents could incurr radiation exposure in addition to those presented in this report as a result of employment at HMC. Occupational exposures were, however, not considered in this report.

In addition to the previously discussed cancer, an estimate of the risk for induction of leukemia can be derived. Using a risk coefficient of 4E-6/person-rem from the BEIR III report (7) and a total estimated red bone marrow dose of 62 mrem from Tables 2.8 and 2.10, a risk of 0.25 chances per million per year of exposure is calculated. If all 200 community residents received the average red bone marrow dose for 8.6 years, 0.0004 leukemias would be expected.

As a further clarification of potential risk to the exposed population, various authorities have established working level limits as shown in Table 3.3. These limits are divided into three categories: required remedial action, remedial action may be necessary and no action required. Table 3.3 values can be compared to the measured average radon value of 4.86 pCi/l which converts to 0.025 WL assuming 51% equilibrium and the 0.029 WL measured directly at the nearest resident to the tailings pile. This data suggests that remedial action may be necessary or, according to some of the established limits, be required.

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PART V
ASSURANCES

The Applicant hereby agrees and certifies that he will comply with the regulations, policies, guidelines, and requirements including OMB Circular No. A-95, A-102 and FMC 74-4, as they relate to the application, acceptance and use of Federal funds for this Federally assisted project. Also the Applicant agrees and certifies with respect to the grant that.

1. It possesses legal authority to apply for the grant; that a resolution, motion or similar action has been duly adopted or passed as an official act of the applicant's governing body, authorizing the filing of the application, including all understandings and assurances contained therein, and directing and authorizing the person identified as the official representative of the applicant to act in connection with the application and to provide such additional information as may be required.

2. It will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352) and in accordance with Title VI of that Act, no person in the United States shall, on the ground of race, color, or nation origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the applicant receives Federal financial assistance and will immediately take any measures necessary to effectuate this agreement.

3. It will comply with Title VI of the Civil Rights Act of 1964 (42 USC 2000d) prohibiting employment discrimination where (1) the primary source of a grant is to provide employment or (2) discriminatory employment practices will result in unequal treatment of persons who are or should be benefiting from the grant-aided activity.

4. It will comply with requirements of the provisions of the Uniform Relocation Assistance and Real Property Acquisitions Act of 1970 (P.L. 91-646) which provides for fair and equitable treatment of persons displaced as a result of Federal and federally assisted programs.

5. It will comply with the provisions of the Hatch Act which limit the political activity of employees.

6. It will comply with the minimum wage and maximum hours provisions of the Federal Fair Labor Standards Act, as they apply to employees of institutions of higher education, hospitals, other non-profit organizations, and to employees of State and local governments who are not employed in integral operations in areas of traditional governmental functions.

7. It will establish safeguards to prohibit employees from using their positions for a purpose that is or gives the appearance of being motivated by a desire for private gain for themselves or others, particularly those with whom they have family, business, or other ties.

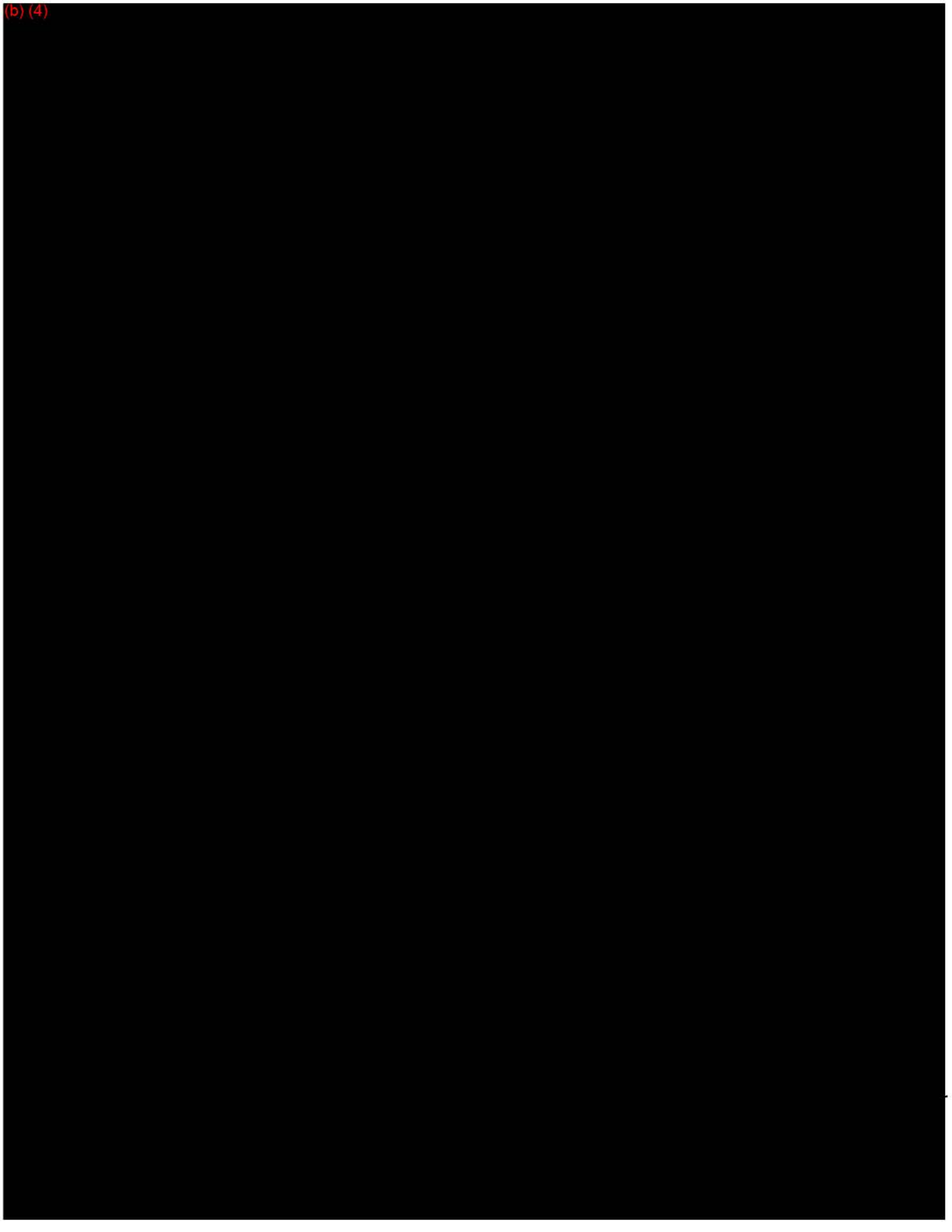
8. It will give the grantor agency and the Comptroller General through any authorized representative the access to and the right to examine all records, books, papers, or documents related to the grant

9. It will comply with all requirements imposed by the Federal grantor agency concerning special requirements of law, program requirements, and other administrative requirements.

10. It will insure that the facilities under its ownership, lease or supervision which shall be utilized in the accomplishment of the project are not listed on the Environmental Protection Agency's (EPA) list of Violating Facilities and that it will notify the Federal grantor agency of the receipt of any communication from the Director of the EPA Office of Federal Activities indicating that a facility to be used in the project is under consideration for listing by the EPA.

11. It will comply with the flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973, Public Law 93-234, 87 Stat. 975, approved December 31, 1976. Section 102(a) requires, on and after March 2, 1975, the purchase of flood insurance in communities where such insurance is available as a condition for the receipt of any Federal financial assistance for construction or acquisition purposes for use in any area that has been identified by the Secretary of the Department of Housing and Urban Development as an area having special flood hazards.

12. It will comply with all applicable requirements of Section 13 of the Clean Water Act Amendments of 1972 (P.L. 92-500), if the grant is awarded under any grant authority of that Act, which provides that no person in the United States shall, on the ground of sex be excluded from participation in, be denied the benefits of, or be otherwise subject to discrimination under any program or activity under the said Clean Water Act Amendments for which the applicant receives financial assistance and will take all necessary measures to effectuate this agreement.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